ConnectX® IB HCA Cards With QSFP Connectors User's Manual

P/N: MHRH19-XTC, MHRH29-XSC, MHRH29-XTC, MHQH19-XTC, MHQH29-XSC, MHQH29-XTC
Rev 1.3

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ConnectX® IB InfiniBand Adapter Cards With QSFP Connectors User's Manual

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Revision History

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Table 1 - Revision History Table

Date	Rev	Comments/Changes
December 2008	1.3	Fixed links to website Added single port cards
August 2008	1.05	Added French Translation of Safety Warnings Removed Watermark
April 2008	0.20	Added MHRH Changed Link from OFED to Mellanox ODFED Removed Confidential
March 2008	0.10	Initial Release

About this Manual

This *User's Manual* describes Mellanox Technologies MH[RQ]H[12]9-X[ST]C ConnectX IB PCI Express x8 HCA Adapter cards. It provides details as to the interfaces of the board, specifications, required software and firmware for operating the board, and relevant documentation.

Intended Audience

This manual is intended for the installer and user of these cards.

The manual assumes basic familiarity with Infiniband® networks and architecture specifications.

Related Documentation

Table 2 - Documents List

Mellanox Firmware Tools (MFT) User's Manual Document no. 2204UG	User's Manual describing the set of MFT firmware management tools for a single InfiniBand node. See http://www.mellanox.com > Downloads > Firmware Tools
Mellanox MST User's Manual Document no. 2125SM	This manual describes various tools and utilities, included in the Mellanox Software Tools (MST) package, for accessing, burning firmware, and tracing Mellanox silicon devices.
IB Specifications Release 1.0.a	Infiniband Architecture Specifications
PCI Express 2.0 Specifications	Industry Standard PCI Express 2.0 Card Electromechanical Specification, Rev 1.3.

Online Resources

- Mellanox Technologies Web pages: http://www.mellanox.com
- Mellanox Technologies Firmware download Web page: http://www.mellanox.com > Downloads > Firmware
- Mellanox Technologies Document Distribution System (DDS): http://docs.mellanox.com (requires a customer login account)

Document Conventions

When discussing memory sizes, MB and MBytes are used in this document to mean size in mega bytes. The use of Mb or Mbits (small b) indicates size in mega bits.

1 Overview

This document is a *User's Manual* for Mellanox Technologies host channel adapter (HCA) cards based on the MTץ25408

ConnectX® IB integrated circuit device. The cards described in this manual have the following main features:

- IBTA v1.2 compliant
- QSFP ports for connecting InfiniBand traffic
- Compliant with QSFP MSA spec Rev. 1.0
- Compatible with copper cable and optical cable with the use of a QSFP connector
- PCI Express 2.0 (1.1 compatible) through an x8 edge connector up to 5GT/s
- EU Restriction of Hazardous Substances (RoHS) compliant
- Two bracket heights: short or tall

1.1 Adapter Cards

Table 3 lists the InfiniBand HCA cards described in this manual.

Table 3 - HCA Cards List

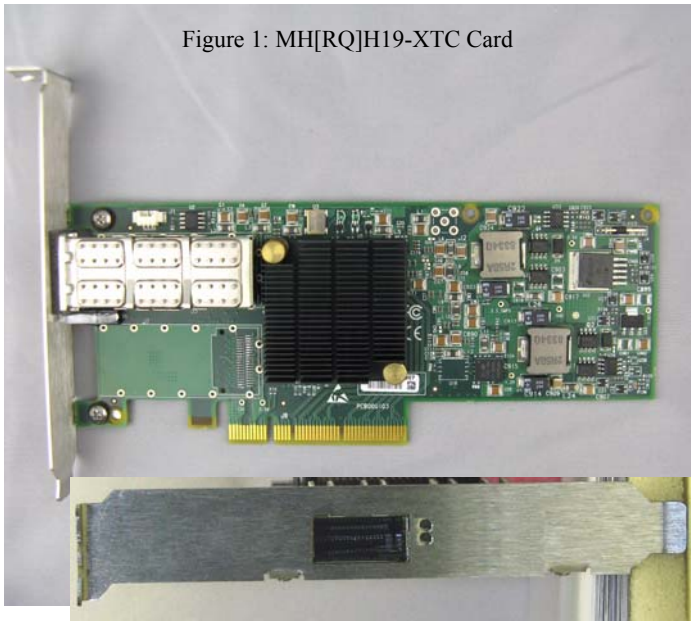
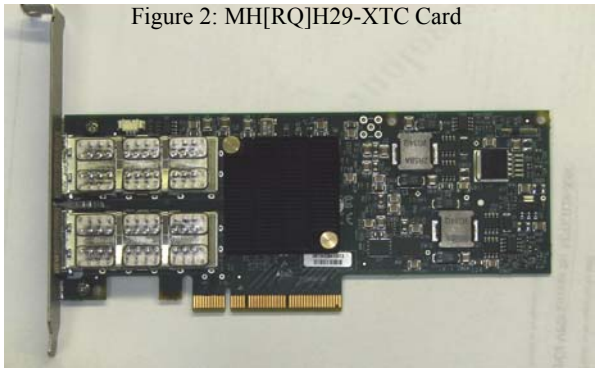
Ordering Part Number (OPN)	IB Port Speed	On-board Memory Size	Short / Tall Bracket	HCA Card with Brackets
MHRH19-XTC	20Gb/s (DDR) Single port	No Mem	Tall	Figure 1: MH[RQ]H19-XTC Card 
MHQH19-XTC	40Gb/s (QDR) Single port	No Mem	Tall	

Table 3 - HCA Cards List

Ordering Part Number (OPN)	IB Port Speed	On-board Memory Size	Short / Tall Bracket	HCA Card with Brackets
MHRH29-XTC	20Gb/s (DDR) Dual port	No Mem	Tall	Figure 2: MH[RQ]H29-XTC Card 
MHRH29-XSC			Short	
MHQH29-XTC	40Gb/s (QDR) Dual port	No Mem	Tall	Short Bracket Tall Bracket
MHQH29-XSC			Short	

These cards are RoHS-R5 Compliant.

1.2 Mellanox Part Numbering Legend

Table 4 describes the Mellanox Technologies adapter cards part numbering legend.

Table 4 - Mellanox HCA Cards Part Numbering Key

HCA Card OPN MHTS#I-XBR	Field	Decoder
M	Mellanox Technologies	
H	Adapter Type	H = InfiniBand Host Channel Adapter, N = Ethernet Network Interface Card, S = Express Module
T	Media	E=CX4 SDR, G=CX4 DDR, J=CX4 QDR, K=XFP SR, M=SFP+ SR, N=SFP+ LRM, O=SFP+ LR, Q=QSFP QDR, R=QSFP DDR, T=UTP
S	Silicon	H = ConnectX, S = InfiniHost III Lx®, T= InfiniHost®,A = InfiniHost III Ex (Arbel), S = Infini-Host III Lx (Sinai), T = InfiniHost (Tavor)
#	# ports	1 = 1, 2 = 2,

Table 4 - Mellanox HCA Cards Part Numbering Key

HCA Card OPN MHTS#I-XBR	Field	Decoder
I	Host Interface	X = PCI-X, 4 = PCIe x4, 8 = PCIe x8, 9 = PCIe (SerDes @ 5.0 GT/s)
G	Generation	<blank> = Initial product generation
-	Separator	
X	Memory Size	X = MemFree, 1=128MB, 2=256MB, 3=512MB
B	Bracket	S = Short, T = Tall, N = None
R	RoHS	<blank> = non RoHS, C = RoHS w/ Exemption, R = RoHS Lead-Free

1.3 Finding the GUID and Serial Number on the Adapter Cards

All Mellanox HCA adapter cards have a label on the printed side of the adapter card that has the card serial number and the card GUID.

Figure 3: Card Product Label

For example, the part number MHQH29-XSC describes Mellanox Technologies' ConnectX® IB HCA card with dual QSFP ports, a PCIe2.0 x8 5.0GT/s interface, no on-board memory (mem-free), a short PCI bracket, and RoHS R5 compliance. Using the legend,

- field M = M to indicate a Mellanox Technologies product,
- field H = H to indicate an InfiniBand Adapter Card,
- field T = Q to indicate QSFP QDR,
- field S = H to indicate the ConnectX family,
- field # = 2 to indicate two ports,
- field I = 9 to indicate PCI Express 2.0 x8 running at 5.0GT/s,
- field X = X to indicate no on-board memory,
- field B = S to indicate a short bracket, and
- field R = C to indicate RoHS R5 (w/ Exemptions) compliance

2 HCA Card Installation

2.1 Hardware and Software Requirements

Before installing the HCA Adapter card, please make sure that the system meets the hardware and software requirements listed in Table 5.

Table 5 - Hardware and Software Requirements

Requirement	Description
Hardware	PCI Express x8 or x16 slots
Software Operating Systems/Distributions	• For Windows see http://www.mellanox.com > Downloads > InfiniBand SW/Drivers • For Linux see Mellanox OpenFabrics Enterprise Distribution (OFED) software package available via the Mellanox OpenFabrics Web site http://www.mellanox.com > Downloads > InfiniBand SW/Drivers

2.2 Installation Instructions

Read all installation instructions before connecting the equipment to the power source.

2.2.1 Installation Instructions as per Host Machine

The adapter cards listed in Table 3 on page 8 are standard PCI Express cards each with a standard x8 edge connector. Please consult the host machine documentation for instructions on how to install a PCI Express card.

2.3 Safety Warnings

1. **Installation Instructions**

Read all installation instructions before connecting the equipment to the power source.

2. **Over-temperature**

This equipment should not be operated in an area with an ambient temperature exceeding the maximum recommended: 55°C (131°F).
To guarantee proper air flow, allow at least 8cm (3 inches) of clearance around the ventilation openings.

3. **During Lightning - Electrical Hazard**

During periods of lightning activity, do not work on the equipment or connect or disconnect cables.

4. **Copper InfiniBand Cable Connecting/Disconnecting**

Copper InfiniBand cables are heavy and not flexible, as such they should be carefully attached to or detached from the connectors. Refer to the cable manufacturer for special warnings and instructions.

5. **Equipment Installation**

This equipment should be installed, replaced, or serviced only by trained and qualified personnel.

6. **Equipment Disposal**

Disposal of this equipment should be in accordance to all national laws and regulations.

7. **Local and National Electrical Codes**

This equipment should be installed in compliance with local and national electrical codes.

3 Driver Software and Firmware

3.1 Driver Software

For Linux or Windows, download and install the latest OpenFabrics Enterprise Distribution (OFED) software package available via the Mellanox OpenFabrics Web site at http://www.mellanox.com > Downloads > InfiniBand SW/ Drivers. Follow the installation instructions included in the download package.

3.2 Updating HCA Card Firmware

Each HCA card is shipped with the latest version of qualified firmware at the time of manufacturing. Firmware is updated occasionally, and the most recent firmware can be obtained from http://www.mellanox.com > Downloads > Firmware.

3.3 Single HCA Card Firmware Update

Firmware can be updated on the stand alone single card using the **flint** tool of the *Mellanox Firmware Tools (MFT)* package. This package is available for download, along with its user's manual, from the Mellanox Firmware Tools page. See http://www.mellanox.com > Downloads > Firmware Tools.

A firmware binaries table lists a binary file per HCA card. The file name of each such binary is composed by combining the firmware name, the firmware release version, and the card part number. Please contact Mellanox or your assigned Field Application Engineer if you cannot find the firmware binary for your adapter card. This may happen if the product is not yet available for general distribution.

4Adapter Card Interfaces

4.1 I/O Interfaces

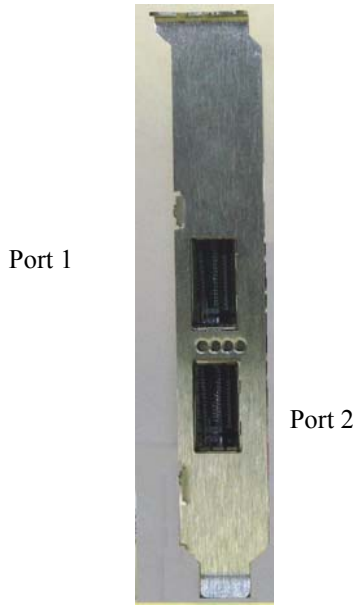
Each HCA card includes the following interfaces:

- QSFP InfiniBand Optical Connectors
- PCI Express x8 edge connector
- I/O panel LEDs
- I^2C compatible connector (for debug)

4.1.1 InfiniBand Interface

The ConnectX®IB(MT25408) device is compliant with the *InfiniBand Architecture Specification, Release 1.2.* It has compliant InfiniBand ports, 1 or 2, each having four Tx/Rx pairs of SerDes. Each of the HCA cards (listed in Table 3 on page 8) based on this device provides access to these ports by means of QSFP InfiniBand connectors. These cards are also compliant with the IBTA specification 1.2. Dual port cards have the following port to connector correspondence. Port 1 connects to connector 1 of the device, while port 2 connects to connector 2.

Figure 4: Port Numbering



4.1.2 PCI Express Interface

The ConnectX IB HCA adapter cards support PCI Express 2.0 (1.1 compatible) through an x8 edge connector. The device can be either a master initiating the PCI Express bus operations or a slave responding to PCI bus operations.

4.1.3 LED Assignment

The board has I/O LEDs located on the I/O panel- 2 LEDs per port. The green LED, when lit, indicates that the Infini-Band driver is running and a valid physical connection between nodes exists. If the green LED is blinking, it indicates a problem with the physical link. The yellow LED when lit, indicates a valid data activity link, this is the logical link. The yellow LED illuminates when the InfiniBand network is discovered over the physical link. A valid data activity link without data transfer is designated by a constant yellow LED indication. A valid data activity link with data transfer is designated by a blinking yellow LED indication. If the LEDs are not active, either the physical link or the logical link (or both) connections have not been established.

Figure 5: Physical and Logical Link Indications

Table 6 - LEDs

Port Number	LED Name
Port 1	Physical Link - Green Constant on indicates a good physical link Blinking indicates a problem with the Physical link
	Data Activity - Yellow Blinking indicates Data Transfer Constant on indicates no Data Transfer
Port 2	Physical Link - Green Constant on indicates a good physical link Blinking indicates a problem with the Physical link
	Data Activity - Yellow Blinking indicates Data Transfer Constant on indicates no Data Transfer

Port 1

Port 2

Note: The short bracket has the same port and LED footprint as the tall bracket.

4.1.4 I^2C Compatible Interface

A three-pin header on the HCA card is provided as the I^2C compatible interface. See Figure 8 on page 19 for the location on the board.

Figure 6: I^2C Connector

4.2 Power

All adapter cards receive 12V and 3.3V power from the PCI Express Edge connector. All other required power voltages are generated by on-board switch mode regulators. See "Specifications" on page 19.

4.3 Memory

The HCA cards support multiple memory devices through the PCI Flash, and I2C-compatible interfaces.

4.3.1 System Memory

Each of the HCA cards utilizes the PCI Express interface to store and access IB fabric connection information and packet data on the system memory.

4.3.2 Flash

Each of the HCA cards includes one 2MB SPI Flash device (M25P80 device by ST Microelectronics) accessible via the Flash interface of the MT25408 ConnectX IB device.

There is a jumper on each adapter card that indicates to the device whether an on-board Flash device is to be used. Table 7 provides information on this jumper. See Figure 8 on page 19 for the jumper location.

Table 7 - Jumper Configuration

Description	Option	Card Default Configuration	Comments
Flash present/ not present	connection open – Flash present connection shorted – Flash not present Figure 7: Flash Jumper 	connection open – Flash present	Header 1x2

4.3.3 EEPROM

Each board incorporates an EEPROM that is accessible through the I2C-compatible interface. The EEPROM is used for storing the Vital Product Data (VPD). The VPD format adheres to the *PCI Local Bus specification rev 2.3* VPD definition. The EEPROM capacity is 512 bytes.

4.4 VPD Layout for DDR/QDR Single and Dual Port HCA Cards

The PCI VPD (Vital Product Data) layout, for each of the described Mellanox Technologies ConnectX IB HCA adapter cards, complies with the format defined in the *PCI 2.3 Specification, Appendix I*. All ConnectX IB HCA adapter cards share the same PCI VPD layout.“A1” was used as the HCA card (PCB) revision. Later revisions of the HCA card will have the same format.

Table 8 - VPD Layout for MHRH[12]9-X[ST]C

Offset (Decimal)	Item	Value	Format	Description
0	Large Resource Type ID String Tag (0x02)	0x82		
1	Length [7:0] LSB	0xD		
2	Length [15:8] MSB	0x0		
3	Data	FALCON IB QDR	STR	
16	Large Resource Type VPD-R Tag (0x10)	0x90		
17	Length [7:0] LSB	0x4F		
18	Length [15:8] MSB	0x00		

Table 8 - VPD Layout for MHRH[12]9-X[ST]C

Offset (Decimal)	Item	Value	Format	Description
19	VPD Keyword	PN	STR	Add in Card Part Number
21	Length	0x15		
22	PN	PN	%STR_SPC	
43	VPD Keyword	EC	STR	Engineering Change Level of the card (rev)
45	Length	0x2		
46	Revision	A1	%STR	PCB revision
48	VPD Keyword	SN	STR	Serial Number
50	Length	0x18		
51	SerialNumber		%STR_SPC	"00..00XXXX..XX"
75	VPD Keyword	V0	STR	Misc Information
77	Length	0x10		
78	Data	PCIe Gen2 x8	STR_SPC	
94	VPD Keyword	RV	STR	
96	Length	0x1		
97	Data	0,96	%CS0	
98	Large Resource Type VPD-W Tag (0x11)	0x91		
99	Length [7:0] LSB	0x9A		
100	Length [15:8] MSB	0x00		
101	VPD Keyword	V1	STR	EFI Driver version
103	Length	0x6		
104	Data	N/A	STR_SPC	
110	VPD Keyword	YA	STR	Asset Tag
112	Length	0x20		
113	Data	N/A	STR_SPC	"N/A"
145	VPD Keyword	RW	STR	Remaining read/write area
147	Length	0x6b		
148	Data		STR_ZERO	Reserved (0x00)
255	Small Resource Type END Tag (0x11)	0x78		

Table 9 - VPD Layout for MHQH[12]9-X[ST]C

Offset (Decimal)	Item	Value	Format	Description
0	Large Resource Type ID String Tag (0x02)	0x82		
1	Length [7:0] LSB	0xD		
2	Length [15:8] MSB	0x0		
3	Data	FALCON IB QDR	STR	
16	Large Resource Type VPD-R Tag (0x10)	0x90		
17	Length [7:0] LSB	0x4F		
18	Length [15:8] MSB	0x00		

Table 9 - VPD Layout for MHQH[12]9-X[ST]C

Offset (Decimal)	Item	Value	Format	Description
19	VPD Keyword	PN	STR	Add in Card Part Number
21	Length	0x15		
22	PN	PN	%STR_SPC	
43	VPD Keyword	EC	STR	Engineering Change Level of the card (rev)
45	Length	0x2		
46	Revision	A1	%STR	PCB revision
48	VPD Keyword	SN	STR	Serial Number
50	Length	0x18		
51	SerialNumber		%STR_SPC	“00..00XXXX..XX”
75	VPD Keyword	V0	STR	Misc. Information
77	Length	0x10		
78	Data	PCIe Gen2 x8	STR_SPC	
94	VPD Keyword	RV	STR	
96	Length	0x1		
97	Data	0,96	%CS0	
98	Large Resource Type VPD-W Tag (0x11)	0x91		
99	Length [7:0] LSB	0x9A		
100	Length [15:8] MSB	0x00		
101	VPD Keyword	V1	STR	EFI Driver version
103	Length	0x6		
104	Data	N/A	STR_SPC	
110	VPD Keyword	YA	STR	Asset Tag
112	Length	0x20		
113	Data	N/A	STR_SPC	“N/A”
145	VPD Keyword	RW	STR	Remaining read/write area
147	Length	0x6b		
148	Data		STR_ZERO	Reserved (0x00)
255	Small Resource Type END Tag (0x11)	0x78		

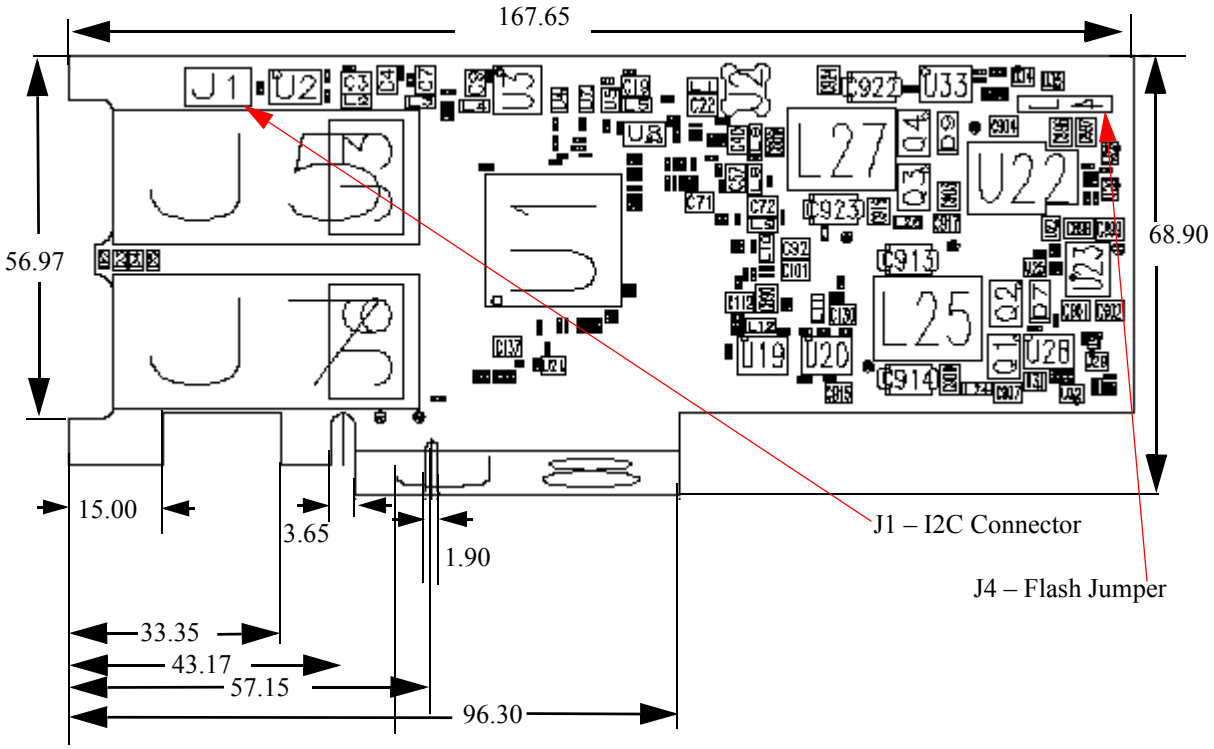
Appendix A: Specifications

A.1 Board Mechanical Drawing and Dimensions

All of the HCA cards covered in this *User's Manual* have the same mechanical drawing and share the same dimensions as depicted in Figure 8.

Note: All dimensions are in millimeters.

Figure 8: Schematic of the ConnectX IB HCA Card with QSFP Connectors



A.2 EMC Certification Statements

Table 10 lists the approved certification status per HCA card in different regions of the world.

Table 10 - HCA Cards Certification Status

HCA Card P/N	FCC Class (USA)	EN Class (Europe)	ICES Class (Canada)	VCCI (Japan)	MIC/BCC (Korea)
MHRH19-XTC	Class A	Class A	Class A	Class A	Class A
MHQH19-XTC	Class A	Class A	Class A	Class A	Class A
MHRH29-XSC	Class A	Class A	Class A	Class A	Class A
MHRH29-XTC	Class A	Class A	Class A	Class A	Class A
MHQH29-XSC	Class A	Class A	Class A	Class A	Class A
MHQH29-XTC	Class A	Class A	Class A	Class A	Class A

FCC Statements (USA)

Class A Statements:

§ 15.21

Statement

Warning! Changes or modifications to this equipment not expressly approved by the party responsible for compliance (Mellanox Technologies) could void the user's authority to operate the equipment.

§15.105(a)

Statement

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

A.2.1 EN Statements (Europe)

EN55022 Class A Statement:

Warning

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

A.2.2 ICES Statements (Canada)

Class A Statement:

"This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada."

A.2.3 VCCI Statements (Japan)

Class A Statement:

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

(Translation - "This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.")

A.3 MHRH19-XTC Specifications

Table 11 - Specifications for MHRH19-XTC

Physical		**Power and Environmental**	
Size:	2.71in. x6.60in. (68.90mm x 167.65mm)	Voltage: Maximum Power:	12V, 3.3V 12W max. for passive cables only 14.5W max. for active optic modules
Air Flow:	200LFM @55°C		
QSFP 20Gb/s Connector:	InfiniBand (Copper and optical) Max power per port 3.5 W.	Temperature:	0°C to 55°C
Protocol Support		**Regulatory**	
InfiniBand:	IBTA v1.2, Auto-Negotiation[1] (20Gb/s, 5Gb/s) or (10Gb/s, 2.5Gb/s)	EMC:	FCC 47 CFR part 15:2006, subpart B, class A ICES-003:2004 Issue 4, class A VCCI V-3/2007.04, class A EN 55022:1998+A1:2000+A2:2003 class A, EN 61000-3-2:2000+A2:2005, EN61000-3-3:1995+A2:2005, EN 55024:1998 + A1:2001+A2:2003 standards, harmonized under EMC Directive 2004/108/EC Article 6(2); AS/NZS 3548
QoS:	8 InfiniBand Virtual Lanes for each port		
RDMA Support:	Yes, All Ports		
Data Rate:	DDR		
PCI Express	2.0 SERDES @ 5.0 GT/s	Safety:	IEC/EN 60950-1:2001 ETSI EN 300 019-2-2 IEC 60068-2- 64, 29, 32
		Environmental: RoHS:	RoHS-R5

1. The auto-negotiation protocol is proprietary of Mellanox Technologies and compliant with the *InfiniBand Architecture Specification, Release 1.2*.

A.4 MHQH19-XTC Specifications

Table 12 - Specifications for MHRH19-XTC

Physical		**Power and Environmental**	
Size:	2.71in. x6.60in. (68.90mm x 167.65mm)	Voltage: Maximum Power:	12V, 3.3V 12.6W max. for passive cables only 15.1W max. for active optic modules
Air Flow:	200LFM @55°C		
QSFP 40Gb/s Connector:	InfiniBand (Copper and optical) Max power per port 3.5 W.	Temperature:	0°C to 55°C
Protocol Support		**Regulatory**	
InfiniBand:	IBTA v1.2, Auto-Negotiation[1] (20Gb/s, 5Gb/s) or (10Gb/s, 2.5Gb/s)	EMC:	FCC 47 CFR part 15:2006, subpart B, class A ICES-003:2004 Issue 4, class A VCCI V-3/2007.04, class A EN 55022:1998+A1:2000+A2:2003 class A, EN 61000-3-2:2000+A2:2005, EN61000-3-3:1995+A2:2005, EN 55024:1998 + A1:2001+A2:2003 standards, harmonized under EMC Directive 2004/108/EC Article 6(2); AS/NZS 3548
QoS:	8 InfiniBand Virtual Lanes for each port		
RDMA Support:	Yes, All Ports		
Data Rate:	QDR		
PCI Express	2.0 SERDES @5.0 GT/s	Safety:	IEC/EN 60950-1:2001 ETSI EN 300 019-2-2 IEC 60068-2- 64, 29, 32
		Environmental: RoHS:	 RoHS-R5

1. The auto-negotiation protocol is proprietary of Mellanox Technologies and compliant with the *InfiniBand Architecture Specification, Release 1.2*.

A.5 MHRH29-X[ST]C Specifications

Table 13 - Specifications for MHRH29-XSC/-XTC

Physical		**Power and Environmental**	
Size:	2.71in. x6.60in. (68.90mm x 167.65mm)	Voltage: Maximum Power:	12V, 3.3V 13W max. for passive cables only 18W max. for active optic modules
Air Flow:	200LFM @55°C		
QSFP 20Gb/s Connector:	InfiniBand (Copper and optical) Max power per port 3.5 W.	Temperature:	0°C to 55°C
Protocol Support		**Regulatory**	
InfiniBand:	IBTA v1.2, Auto-Negotiation[1] (20Gb/s, 5Gb/s) or (10Gb/s, 2.5Gb/s)	EMC:	FCC 47 CFR part 15:2006, subpart B, class A ICES-003:2004 Issue 4, class A VCCI V-3/2007.04, class A EN 55022:1998+A1:2000+A2:2003 class A, EN 61000-3-2:2000+A2:2005, EN61000-3-3:1995+A2:2005, EN 55024:1998 + A1:2001+A2:2003 standards, harmonized under EMC Directive 2004/108/EC Article 6(2); AS/NZS 3548
QoS:	8 InfiniBand Virtual Lanes for each port		
RDMA Support:	Yes, All Ports		
Data Rate:	DDR		
PCI Express	2.0 SERDES @ 5.0 GT/s	Safety:	IEC/EN 60950-1:2001 ETSI EN 300 019-2-2 IEC 60068-2- 64, 29, 32
		Environmental: RoHS:	 RoHS-R5

1. The auto-negotiation protocol is proprietary of Mellanox Technologies and compliant with the *InfiniBand Architecture Specification, Release 1.2*.

A.6 MHQH29-X[ST]C Specifications

Table 14 - Specifications for MHRH29-XSC/-XTC

Physical		**Power and Environmental**	
Size:	2.71in. x6.60in. (68.90mm x 167.65mm)	Voltage: Maximum Power:	12V, 3.3V 13.5W max. for passive cables only 18.5W max. for active optic modules
Air Flow:	200LFM @55°C		
QSFP 40Gb/s Connector:	InfiniBand (Copper and optical) Max power per port 3.5 W.	Temperature:	0°C to 55°C
Protocol Support		**Regulatory**	
InfiniBand:	IBTA v1.2, Auto-Negotiation[1] (20Gb/s, 5Gb/s) or (10Gb/s, 2.5Gb/s)	EMC:	FCC 47 CFR part 15:2006, subpart B, class A ICES-003:2004 Issue 4, class A VCCI V-3/2007.04, class A EN 55022:1998+A1:2000+A2:2003 class A, EN 61000-3-2:2000+A2:2005, EN61000-3-3:1995+A2:2005, EN 55024:1998 + A1:2001+A2:2003 standards, harmonized under EMC Directive 2004/108/EC Article 6(2); AS/NZS 3548
QoS:	8 InfiniBand Virtual Lanes for each port		
RDMA Support:	Yes, All Ports		
Data Rate:	QDR		
PCI Express	2.0 SERDES @ 5.0GT/s	Safety:	IEC/EN 60950-1:2001 ETSI EN 300 019-2-2 IEC 60068-2- 64, 29, 32
		Environmental: RoHS:	 RoHS-R5

1. The auto-negotiation protocol is proprietary of Mellanox Technologies and compliant with the *InfiniBand Architecture Specification, Release 1.2*.

Appendix B: Interface Connectors Pinout

B.1 I2C-Compatible Connector Pinout

Figure 7: I2C-Compatible Connector Plug and Pinout

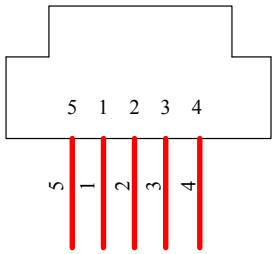


Table 15 - I2C-compatible Connector Pinout

Connector Pin Number	HCA Signal Name
1	SPSDA
2	SPSCL
3	GND
4	NC
5	NC

B.2 PCI Express x8 Connector Pinout

These cards use a standard PCI Express x8 edge connector and the PCI Express x8 standard pinout according to the PCI Express 2.0 specification.

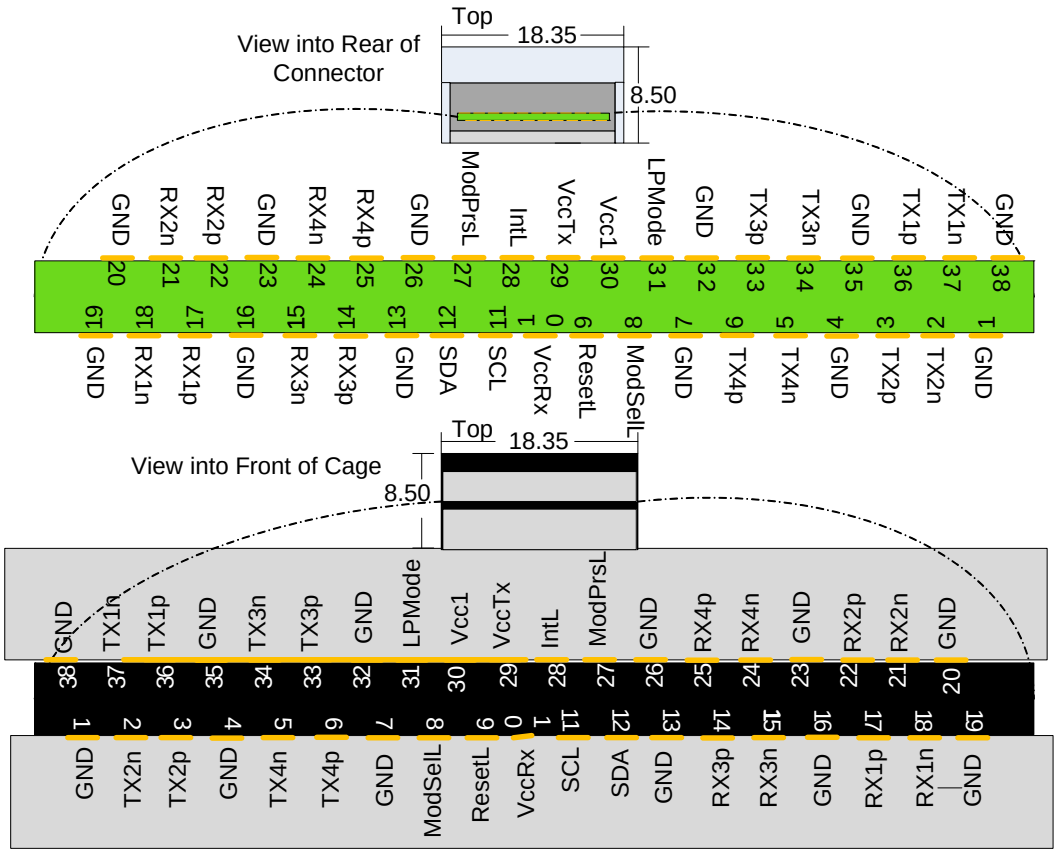
B.3 QSFP Connector Pinout

Figure 8: QSFP Connector Pinout

Table 16 - Connector Pin Name and Number to Signal Name Correspondence

Connector Pin Number	Connector Pin Name	IB Port A Signal Name
1	GND	GND
2	TXN_2	Tx2n
3	TXP_2	Tx2p
4	GND	GND
5	TXN_4	Tx4n
6	TXP_4	Tx4p
7	GND	GND
8	ModSelL_Port0	ModSelL
9	ResetL_Port0	ResetL
10		VccRx
11	SCL	SCL
12	SDA	SDA
13	GND	GND
14	RXP_3	Rx3p
15	RXN_3	Rx3n
16	GND	GND
17	RXP_1	Rx1p
18	RXN_1	Rx1n
19	GND	GND
20	GND	GND
21	RXN_2	Rx2n
22	RXP_2	Rx2p
23	GND	GND
24	RXN_4	Rx4n
25	RXP_4	Rx4p
26	GND	GND
27	ModPrsl_Port0	Mod PrsL
28	IntL	IntL
29		VccTx
30		Vcc1
31	LPMode_Port0	LPMode
32	GND	GND
33	TXP_3	Tx3p
34	TXN_3	Tx3n
35	GND	GND
36	TXP_1	Tx1p
37	TXN_1	Tx1n
38	GND	GND

Figure 9: Connector and Cage Views


Top
18.35
View into Rear of Connector
8.50
GND RX2n RX2p GND RX4n RX4p GND ModPrsL IntL VccTx Vcc1 LPMode GND TX3p TX3n GND TX1p TX1n GND
20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
GND RX1n RX1p GND RX3n RX3p GND SDA SCL VccRx ResetL ModSelL GND TX4p TX4n GND TX2p TX2n GND
Top
18.35
View into Front of Cage
8.50
GND TX1n TX1p GND TX3n TX3p GND LPMode Vcc1 VccTx IntL ModPrsL GND RX4p RX4n GND RX2p RX2n GND
38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
GND TX2n TX2p GND TX4n TX4p GND ModSelL ResetL VccRx SCL SDA GND RX3p RX3n GND RX1p RX1n GND

Appendix C: Replacing a Tall Bracket With a Short Bracket on HCA Cards

This appendix provides instructions on how to remove the tall bracket of a standard Mellanox Technologies HCA card and replace it with a short one. It includes the following sections:

- Removing a bracket
- Installing a new bracket

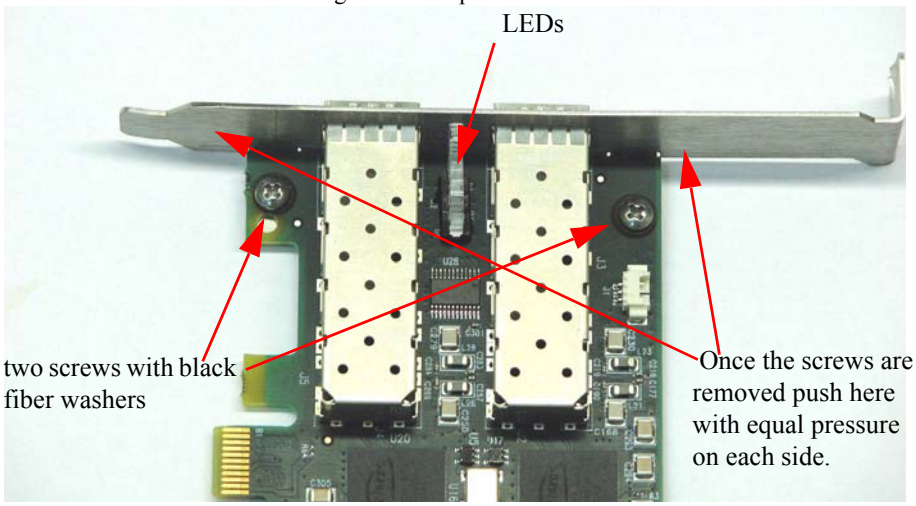
C.1 Replacing a Bracket

To replace the bracket you will need the following parts:

- the new bracket of the proper height
- the 2 screws saved from the removal of the bracket
- the 2 fiber washers saved from the removal of the bracket

C.1.1 Remove the Existing Bracket from the Adapter Card

Figure 10: Adapter Card

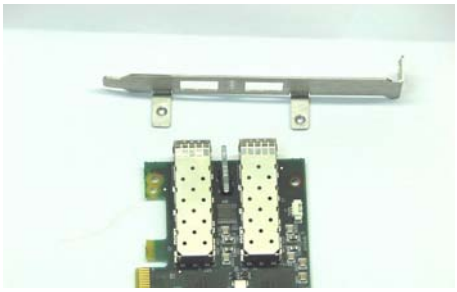


1 Remove the two screws holding the bracket in place.
2. Simultaneously push on both ends of the bracket until the bracket comes loose from the card.

   Note: Be careful not to put stress on the LEDs.

3. Save the two screws and the two fiber washers.

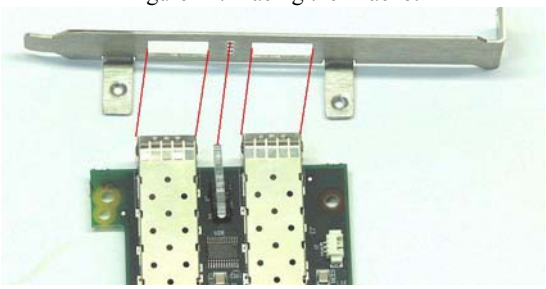
Figure 11: Adapter card With Bracket Removed



C.1.2 Installing the New Bracket

4. Place the bracket over the connector cages and push the bracket onto the card until the screw holes line up.

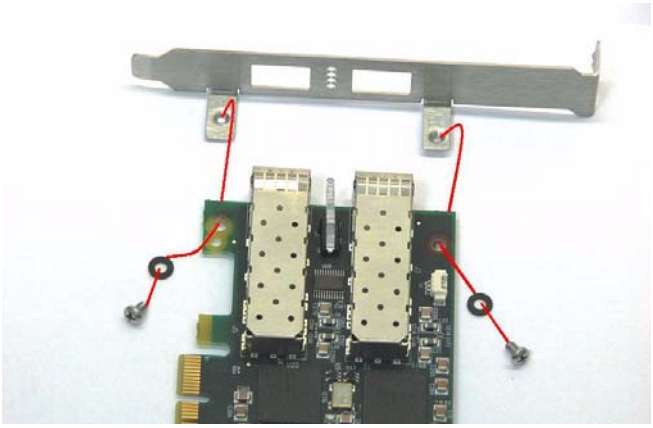
Figure 12: Placing the Bracket



Note: Do not force the bracket onto the card. You may have to gently push the LEDs using a small screw-driver to align the LEDs with the holes in the bracket.

5. Take the screws and washers saved from Step 1. Place the screws and washers into the holes and screw them in snug.

Figure 13: Placing the Bracket on the Card



6. Make sure that the LEDs are aligned onto the bracket holes.
7. Use a torque driver to apply up to 2 lbs-in torque on the screws.

Appendix D: Avertissements de sécurité d'installation (French)

1. Instructions d'installation

Lisez toutes les instructions d'installation avant de brancher le matériel à la source d'alimentation électrique.

2. Température excessive

Ce matériel ne doit pas fonctionner dans une zone avec une température ambiante dépassant le maximum recommandé de 55°C (131°F). Un flux d'air de 200LFM à cette température ambiante maximale est nécessaire. En outre, pour garantir un bon écoulement de l'air, laissez au moins 8 cm (3 pouces) d'espace libre autour des ouvertures de ventilation.

3. Orages – dangers électriques

Pendant un orage, il ne faut pas utiliser le matériel et il ne faut pas brancher ou débrancher les câbles.

4. Branchement/débranchement des câbles InfiniBand en cuivre

Les câbles InfiniBand en cuivre sont lourds et ne sont pas flexibles, il faut donc faire très attention en les branchant et en les débranchant des connecteurs. Consultez le fabricant des câbles pour connaître les mises en garde et les instructions spéciales.

5. Installation du matériel

Ce matériel ne doit être installé, remplacé ou entretenu que par du personnel formé et qualifié.

6. Elimination du matériel

L'élimination de ce matériel doit s'effectuer dans le respect de toutes les législations et réglementations nationales en vigueur.

7. Codes électriques locaux et nationaux

Ce matériel doit être installé dans le respect des codes électriques locaux et nationaux.

Appendix E: Installation - Sicherheitshinweise (German)

1. Installationsanleitungen

Lesen Sie alle Installationsanleitungen, bevor Sie das Gerät an die Stromversorgung anschließen.

2. Übertemperatur

Dieses Gerät sollte nicht in einem Bereich mit einer Umgebungstemperatur über der maximal empfohlenen Temperatur von °C (°F) betrieben werden. Es ist ein Luftstrom von 200 LFM bei maximaler Umgebungstemperatur erforderlich. Außerdem sollten mindestens 8 cm (3 in.) Freiraum um die Belüftungsöffnungen sein, um einen einwandfreien Luftstrom zu gewährleisten.

3. Bei Gewitter - Elektrische Gefahr

Arbeiten Sie während eines Gewitters und Blitzschlag nicht am Gerät, schließen Sie keine Kabel an oder ab.

4. Anschließen/Trennen von InfiniBand-Kupferkabel

InfiniBand-Kupferkabel sind schwer und nicht flexible. Deshalb müssen sie vorsichtig an die Anschlüsse angebracht bzw. davon getrennt werden. Lesen Sie die speziellen Warnungen und Anleitungen des Kabelherstellers.

5. Geräteinstallation

Diese Gerät sollte nur von geschultem und qualifiziertem Personal installiert, ausgetauscht oder gewartet werden.

6. Geräteentsorgung

Die Entsorgung dieses Geräts sollte unter Beachtung aller nationalen Gesetze Bestimmungen erfolgen.

7. Regionale und nationale elektrische Bestimmungen

Dieses Gerät sollte unter Beachtung der regionalen und nationalen elektrischen Bestimmungen installiert werden.